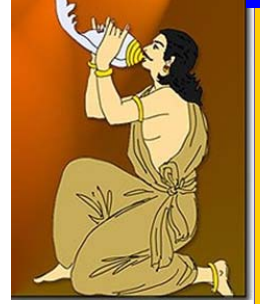




# SOUND BYTES



**Decibel 22**  
**Frequency 2**  
**June 2022 issue**  
Email ID: [soundbytesisnt@gmail.com](mailto:soundbytesisnt@gmail.com)

Official Newsletter of ISNT Chennai Chapter

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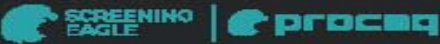


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**Indian Society for Non-Destructive Testing , Chennai Chapter**  
**Module 59, 3<sup>rd</sup> floor, Readymade Garment Complex. SIDCO Industrial Estate, Guindy, Chennai 600 032. Phone 044-45532115, 7200086075.**  
**Email: [isntchennaichapter@gmail.com](mailto:isntchennaichapter@gmail.com); Website: [www.isnt.in](http://www.isnt.in)**

## MEMOIRS OF OUR CHAIRMAN

Dear All,

It gives us immense pleasure to place before you the 5th issue of Sound Bytes. This issue is of 16 pages. The extended pages is the result of untiring effort put in by your EC. It bounced back with a vengeance. The EC had been silently working in spite of the curbs and you are seeing the result. The actions taken have far reaching effects.

1. Training & Certification is back on rails with added courses on IR & PAUT,
2. Inaugurating Students chapter at Eswari Engineering College as well as the workshops at Veltech Institute & Guindy engineering college ensures continuity of NDT,
3. At the ISNT day function, Shri. I.M.Rao our first Chairman donated a purse of Rs.5,00,000 for furthering the cause of NDT in the name of his wife Late. Smt. Ivaturi Bala Rao. An act of immense consequence,
4. Shri.M.V.Vivek, an EC member contributed a bench model (Head & Coil Shot) equipment -1000 Amps AC & HWDC, to our chapter.

These activities certainly produce cascading effect with far reaching possibilities.

**LONG LIVE CHENNAI CHAPTER.**

*Ram*

Dear Readers,

Greetings and best wishes. It gives me great pleasure to share my views on the SOUND BYTES as Chairman of ISNT Chennai Chapter. Although the pandemic period was very difficult, we have learnt a lot of new lessons that have influenced newer ideas. One such ideation was our e-newsletter, Soundbytes.

We wanted to stay in touch with our members virtually and keep them posted on all the activities. Initially, we started with our members and now it has reached more than 20,000 viewers. Our newsletter provides a brief of the activities done by our chapter, question & answers related to NDT, technical paper, quiz, interview with the leading personality in the NDT field and more that could benefit the readers.

The SOUND BYTES is compiled by our veteran member and advisor Shri. B. RamPrakash, who took it as great challenge and published the newsletters in an excellent manner and he was ably assisted by a team of our members. At present we target one lakh viewers. This is only possible with your support by providing your friends and fellow NDTians contact email id to us. We have gathered interests of not only the members but also the NDT equipments manufacturers. In our recent issues, more manufacturers have come forward to display their products and are ready to sponsor the issues.

My request to all the readers is that kindly send your feedbacks, suggestions, and other important events in your carrier in the NDT field. You are also welcome to share any technical problems you are facing during the NDT inspection so that they can be addressed by our team members or experts in the relevant field.

My congratulations and compliments to Shri B.Ramprakash and his team. Hope the forthcoming Chairman will take this SOUND BYTES forward and to newer heights.

with regards

S Subramanian  
Chairman, ISNT CC



## PROPOSED MISSION STATEMENT "CARING IS SHARING"

Dear Readers,

We propose the above mission statement for your Sound Bytes. We request you to share your opinion.

## ISNT Chennai Chapter News

### Courses & Examinations Conducted:

1. UT Level-II 07.02.2022 to 18.02.2022 Course Director: Mr.P.Anandan  
Examiner: Mr.E.Sathya Srinivasan / Mr.Nickolas
2. RT Level-II 23.02.2022 to 06.03.2022 Course Director: Mr. E.Sathya Srinivasan  
Examiner: Mr.C.Srinivasan / Mr.G.Raghu
3. MT & PT Level-II 21.04.2022 to 30.04.2022 Course Director: Mr. R.Balakrishnan  
Examiner: Mr.R.Chandran / Mr.C.Srinivasan



MT & PT L-II (April 2022) Course Participants

4. RTFI Level-II 09.05.2022 to 14.05.2022 Course Director: Mr.RG.Ganesan  
Examiner: Mr.E.Sathya Srinivasan / Mr.S.R.Ravindran
5. UT Level-II 24.05.2022 to 04.06.2022 Course Director: Mr.B.Ram Prakash

### Courses & Examinations Planned:

1. RT Level-II from 15<sup>th</sup> June 2022 to 25<sup>th</sup> June 2022
2. IR Level-II 27<sup>th</sup> June 2022 to 2<sup>nd</sup> July 2022 .
3. VT Level-II 4<sup>th</sup> July 2022 to 9<sup>th</sup> July 2022
4. ET Level-II 20<sup>th</sup> July 2022 to 30<sup>th</sup> July 2022

### EC meeting:

The Fifth EC meeting was held on 20<sup>th</sup> February 2022 both in physical and virtual formats. Number of attendees - 19. 9 were physically present and 10 attended through video conferencing. The Sixth EC meeting was held on 20<sup>th</sup> March 2022. 20 members attended the meeting. The First EC meeting for the financial year 2022-2023 was held on 15<sup>th</sup> May 2022. 19 members attended the meeting.

### HO news & other chapter news

ISNT Head office announcements and Webinars of other chapters please refer to the Website of HO of ISNT ([www.isnt.in](http://www.isnt.in)).

## NDT DAY CELEBRATION AT VELTECH ON 09.04.2022.

On behalf of ISNT Chennai Chapter Mr.R.Balakrishnan, Chairman – Training and Certification committee addressed the students of Veltech college, Avadi during the Birth day of Dr.Baldev Raj.



A Student chapter was inaugurated on 19th April 2022 at Easwari Engineering College, Ramapuram campus with a strength of 200 student members. Mr.V.Pari, Mr.RG.Ganesan attended the Inaugural function.



Mr.V.Pari and Mr.R.Balakrishnan addressed the Society of Materials engineers of the Guindy Engineering college on Current trends in NDT Technologies and Career Aspects on 27th April 2022 followed by a demonstration in the afternoon.



## ISNT DAY 2022 CELEBRATION

ISNT DAY was celebrated in a grand manner at Hotel Quality Inn Sabari, T.Nagar, Chennai on 21<sup>st</sup> April 2022. A total of 128 personnel (members and their family) attended the function.

Mr.R.Vivek was the Convener of the meeting. Mr.S.Subramanian Chairman presided over the meeting. Chief Guest of the day was Mr.H.Shankar, Director-Technical, CPCL, Chennai and Guest Speaker was Rtn.Dr.S.Sushithra Raajh.

The faculties, the examiners and the laboratories associated with the Chapter were honoured and mementos were presented.

At the function Mr.I.M.Rao, first chairman of ISNT CC announced a donation of Rs.5 Lakhs to the chapter in memory of his wife Mr.Ivaturi Bala Rao.



## Awards given during ISNT DAY 2022

The Best Member Award “Thambidurai Award” sponsored by M/s. Electro-Magfield Controls & Services was awarded to Shri.S.Velumani.

The Best Technical Talk Award “Rajamani Award” sponsored by M/s. Electro-Magfield Controls & Services was awarded to Dr. Debasish Mishra, GE, Bangalore for the year 2020

The Best Technical Talk Award “Rajamani Award” sponsored by M/s. Electro-Magfield Controls & Services was awarded to Prof. Balaji Srinivasan, IIT, Chennai for the year 2021

The Best Participation in courses Award “Pari Award” sponsored by M/s. QTECH was awarded to Ms.R.Gayatri, Naga Engineering, Chennai for the year 2020

The Best Participation in courses Award “Pari Award” sponsored by M/s. QTECH was awarded to Mr. Akash Singh, EIL, Chennai for the year 2021



Mr.S.Velumani receiving the Best Member Award for the year 2021



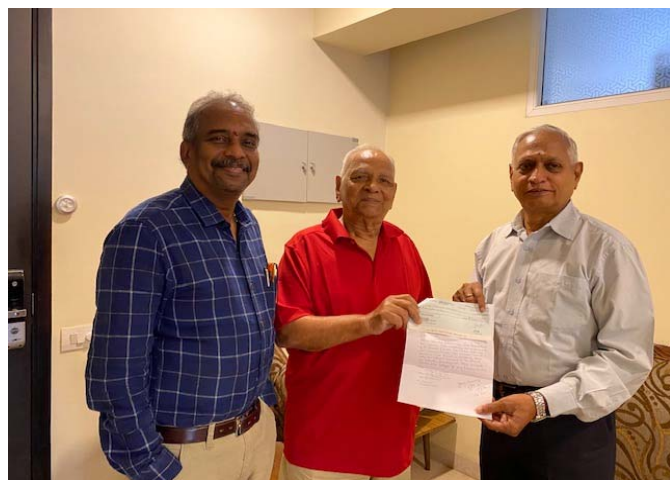
Ms.R.Gayatri receiving the Best Participation in Courses Award for the year 2020



Prof. Balaji Srinivasan receiving the Best Technical Talk Award for the year 2021



Mr.I.M.Rao handing over the cheque to our Chairman, Chairman Elect and Secretary



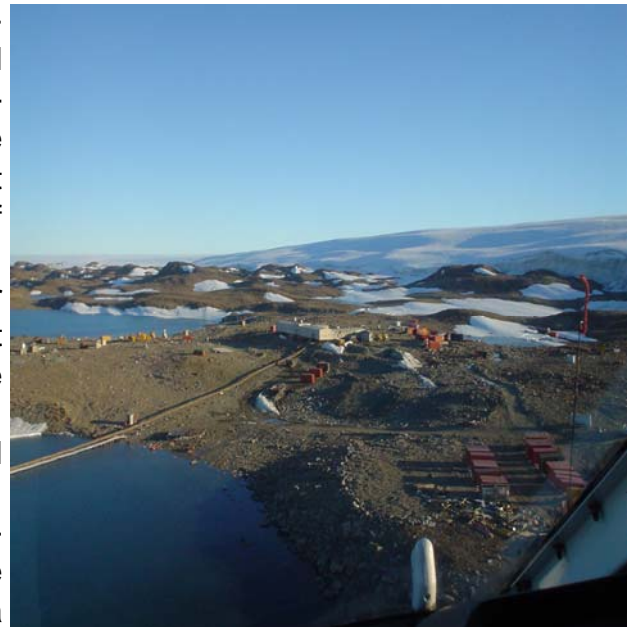
## Ultrasonic, Impact Wave and Accelerometer Measurements for Structural Assessment of the Second Indian Research Station 'Maitri' in Antarctica

Dr. G. Raghava\* and S.G.N. Murthy\*\*

\*Professor in Civil Engineering, Nitte Meenakshi Institute of Technology, Bengaluru - 560064; Former Chief Scientist & Head, Fatigue & Fracture Laboratory, CSIR - Structural Engineering Research Centre, Chennai - 600113; raghava.g@nmit.ac.in, raghavag@yahoo.com

\*\*Senior Principal Scientist, CSIR - Structural Engineering Research Centre, Chennai - 600113; sgnmurthy@serc.res.in

The Second Indian Research Station 'Maitri' in Antarctica was indigenously developed and constructed by R&DE (Engineers), Pune. The station was commissioned in Antarctica in 1989. Because of some damage observed in the structure and the fact that the structure had already completed 15 year. As of service as against the design life of 10 years, SERC, Chennai was approached by the National Centre for Antarctic & Ocean Research, in 2003, to carry out 'Structural assessment of the Maitri structure. The authors participated as team members of the XXIII Indian Scientific Expedition to Antarctica and carried out the structural assessment of the Maitri structure. They were a part of the expedition team from December 2003 to April 2004. Ultrasonic, impact wave and accelerometer measurements carried out as a part of the structural assessment are briefly explained here.



Aerial view of Maitri and its immediate surroundings



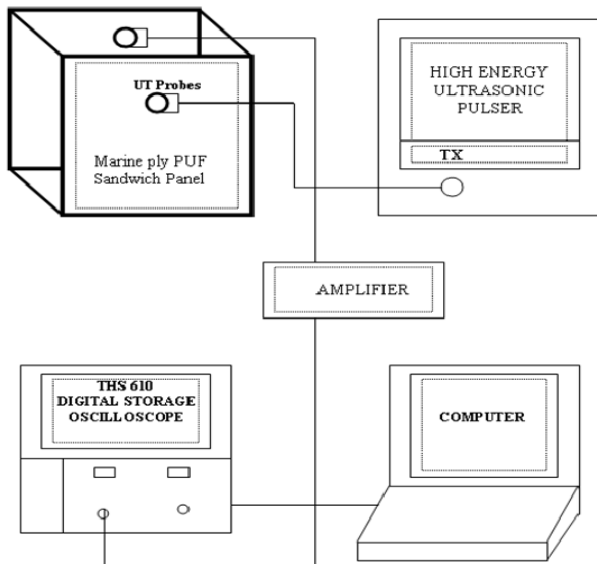
Close-up front view of Maitri station



Close-up view of Maitri main block showing steel supporting structure and sandwiched plywood wall panels

Tests of ultrasonic and impact wave measurement techniques were carried out on samples of panels made of marine ply sandwiched by PU foam as insulating material. The supporting columns of the Maitri structure were numbered and thickness measurements were made in the columns by using an ultrasonic thickness gauge. Four numbers of accelerometers were installed on Maitri, at roof level, two in the front and two in the rear, for measurement of acceleration during high wind speeds. Data were recorded when wind speed was approximately 45 knots with gusts of 80 knots.

Ultrasonic testing of marine plywood panels sandwiched by polyurethane foam: Application of ultrasonic amplitude analysis technique to a sample piece of marine plywood sandwiched by polyurethane foam was verified for detecting dis-bonds and faults in the panel. It was found that there was a significant loss in the ultrasonic signal amplitude when passing through dis-bonds. Thus, it was established that the technique could be used for qualitative testing of sandwiched plywood panels. This technique could not be applied to the panels in the Maitri structure since the panels had an internal layer of a fire-retardant material 'Gypsum' board and an external layer of 'Plastisol'-coated GI sheet.



Schematic of experimental set-up for ultrasonic testing of panel



Trial testing of sandwiched plywood panel by ultrasonic amplitude analysis

Thickness measurement in supporting columns of Maitri structure: The Main Block and the B Block of the Maitri structure are supported on steel columns at a height varying up to two metres from the ground level. The supporting columns were numbered and thickness measurements were made in the columns by using an ultrasonic thickness gauge. Microprocessor-based, hand-held ultrasonic thickness gauge with LCD display was used. The instrument can measure metal thicknesses from 1 to 300 mm with an accuracy of  $\pm 0.1$  mm. Thickness measurements of the supporting columns showed fairly uniform readings throughout the structure. No drastic localised reduction of thickness was observed anywhere in the columns. This ruled out any localised excessive corrosion of the member.



Ultrasonic thickness gauge and probe



Analysis of acceleration data during gusty wind: Four accelerometers were installed on Maitri, at roof level, two in the front and two in the rear, for measurement of acceleration during high wind speeds. Data were recorded when wind speed was approximately 45 knots with gusts of 80 knots. These data were analysed using FFT (Fast Fourier Transform) procedures. Acceleration, velocity and displacement time histories and their corresponding spectra were obtained. The analysis showed that the structure was sensitive to dynamic wind action.

Detailed visual examination of Maitri structure: Detailed visual examination of the Maitri structure formed a major activity under the structural assessment programme of Maitri station. The examination included exterior and interior of the structure, load-bearing framework and internal structure, joints and interlocking of panels, wherever possible. While taking thickness measurement of supporting columns also, a detailed visual examination of the entire supporting structure, i.e., supporting columns and framework, and the floor panels were carried out. Cracks were identified in nine supporting columns. Length of crack in the supporting columns of the main block varied from 7 to 50 cm and extended below ground level in some columns. It was physically seen that some cracks were through-thickness cracks for part of the length. An evaluation of safety of cracked columns was made and a possible repair measure was suggested.

For more details, readers are requested to refer to the following publications:  
Raghava, G. and Murthy, S.G.N., "Structural Assessment of the Second Indian Station 'Maitri' in Antarctica", in "Engineering and Communications in Antarctica - Enabling Technologies in Antarctica"; Editor: Nelay Khare, Springer Transactions in Civil and Environmental Engineering, Springer Nature Singapore Pte Ltd. 2021, pp.189-199.

Raghava, G. and Murthy, S.G.N., "Structural assessment of Maitri building in Antarctica", In: Scientific Report of Twenty third Indian Expedition to Antarctica, Technical Publication No.21, National Centre for Antarctic & Ocean Research, Ministry of Earth Sciences, Goa, 2010, pp.231-277.



Close-up view of crack in column A17

**WITH BEST COMPLIMENTS  
FROM**



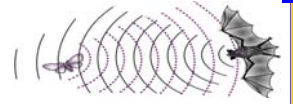
**Chandran Ramalingam,  
Offshore Integrity Assurance Engineer,  
Dubai Petroleum Establishment,  
Dubai.**

**ASNT NDT Level III in  
UT, RT, MT, PT, VT, IR, AE,  
ET, LT, MFL & NR  
API 510, 570, 571, 653 & 580,  
Lead Auditor in QMS, EMS & OSHAS,  
International Welding Engineer (IWE),  
BGAS Painting inspector Grade II.**

## Opportunity

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# ECHO BITES



Dear Mr. Ramprakash,  
Please accept my compliments to you and through you to other members of the compiling board for putting together important and useful information in the latest edition of Sound bytes.

The newsletter has all the ingredients to cater to various segments of industry. Keeping with the release in time is another concept worth mentioning here.

Best wishes and looking forward to many more issues of this remarkable newsletter.

Personal regards  
Pari V

Dear Chairman,

We are in receipt of your mail communication along with Sound Bytes - March 2022 issue on Time.

Excellent Work and Highly Appreciated.

Thanks and Regards  
**RG.Ganesan**

Sir/s

Nicely packed and arranged in suitable for the reader/s. Hats of to the compilers and producers.

With Regards  
Subbaratnam

*Dear Chairman,*

*Sound Bytes 22, April 2022 issue has come out with excellent information about JSNT Chennai Chapter's activities & sharing of knowledge to the readers.*

*It covers remarkable photos, a course calendar for the year 2022-2023, NDT in civil engineering, information about BJS, Technical talk abstracts.*

*Infrared/thermal NDT&E will emerge as one of the most promising NDT methods, which has been clearly understood from the Chat room discussion.*

*Industrial Radiography practices and Questions & Answers sections are joined with due care as informative garlands.*

*Thanks to Mr.B.RamPrakash, Chief compiler, and his team for making this informative garland come out with great successes to spread the latest information about NDT to all age group practitioners and the readers.*

*Kind Regard*

*R.Jayagovindan - LM 6335*

*Dear Readers,*

*Your response & comments are highly appreciated*



**Dr. Debasish Mishra**

## CHAT ROOM



**Dr. Prabhu Rajagopal**

Dr. Debasish Mishra graduated from University of Roorkee with a post-graduate degree specializing in Engineering Physics. He then joined IIT Kanpur for M.Tech and Ph.D program in Nuclear Engineering. Debasish is a recipient of the prestigious Dr. K. S. Krishnan Fellowship of the Department of Atomic Energy, Govt. of India and Young Scientist Award from the Indian Science Congress Association.

Debasish worked at State University of New York (SUNY) Stony Brook as a Research Scientist and at the Idaho State University as a Research Assistant Professor. He joined at GEResearch Center in 2003. Currently he leads the Material Systems and Inspection research group at GE Research Centre.

Debasish has worked in laser/optical interferometry, digital radiography, computed tomography application for non-destructive evaluation of materials.

1. Please tell us about your role at the NDE Group in GE's GRC-Bangalore? How is your Group driving change in the NDE Community?

At GE Research our mission is to stay focused on the possibilities of tomorrow. We don't do new things for the sake of doing research but because there is a big unmet need for the world. We at the NDE group constantly trying to understand challenges with key industrial inspection needs for our businesses and the world at large, then we utilize our multi-disciplinary research centre capabilities to create complete solution for our customers. Our research group is actively involved in various NDE communities like local and international professional bodies related to NDE to help educate all end users of NDE technologies on new possibilities and standardize them for easy adoption. We are committed to building a world that works.

2. What are the prospects for the emerging and exciting technologies in Radiographic NDT that you discussed at your Tech Talk to our Chapter?

High-resolution high-energy radiography, phase imaging and photon counting detectors are emerging technologies in this space. They will take both 2D and 3D applications to a new height in the near future. This will enable more reliable quality inspection of large components made of high-density materials, ability to see low contrast features in the background of thick metals and images with high signal-to noise ratio.

3. What are the core technologies being developed at your Group that you are excited about?

Miniaturization of inspection sensors, robotic integration for deployment, AI based data interpretation are some of the next generation technologies for NDE that will address many customers unmet needs. We are excited to be part of this journey.

4. What are the industry challenges to these technologies and how do you see them overcoming those challenges?

We need parallel growth and speed with standard development, stronger collaborations between academia, research labs and regulating agencies to be able to drive new technology faster to end-users. There must be a single purpose for everyone - making a better, safer and efficient world.

# Model Technique sheets.



**Mr.M.Manimohan, Manager (Retired), NDTL, BHEL, Trichy**

Company's LOGO  
PENETRANT TESTING –FLUORESCENT METHOD

Technique sheet /PT /XX /Rev 00

xx/yy/zzzz

- 1.0 Job Details
- 2.0 Material
- 3.0 Reference
- 4.0 Procedure Reference
- 5.0 Chemicals used
- 6.0 Surface Preparation.
- 7.0 Pre-Cleaning
- 8.0 Penetrant Application
- 9.0 Temperature
- 10.0 Dwell Time
- 11.0 Removal of excess Penetrant
- 12.0 Application of Developer
- 13.0 Development Time
- 14.0 Final Inspection
- 15.0 Lighting
- 16.0 Evaluation and Acceptance
- 17.0 Re exam after Repair
- 18.0 Personnel
- 19.0 Retention Period

PT Procedure No xxxxxxxxxxxxxxxxxxxxxxxxx

Date	Prepared By	Reviewed by	Approved by
Name	ssssssss	rrrrrrrr	ttttttttt
Level	II	III	III

## COMPANY LOGO RADIOGRAPHIC EXAMINATION Technique sheet 01/ Rev xx

- 01. Component :
- 02. Joint description :
- 03. Joint number :
- 04. Joint thickness :
- 06. NDE reference :
- 07. Film :
- 08. Screen :
- 09. Source :
- 10. SFD / FFD :
- 11. Technique :
- 12. Viewing :
- 13. IQI :
- 14. IQI placement :
- 15. IQI location :
- 16. Sensitivity :
- 17. Density :
- 18. Exposure time :
- 19. Acceptance :

### SHOOTING SKETCH

Date	Prepared By	Reviewed By	Approved

**For each component and technique sheets are to be prepared**

**Mr.M.Manimohan, Manager (Retired), NDTL, BHEL, Trichy**



**Company's LOGO**  
**MAGNETIC PARTICLE TESTING FOR BUTT WELD**  
**Technique sheet /MT /01**

- 01. Component :
- 02. Material :
- 03. Reference :
- 04. Equipment :
- 05. Method :
- 06. Surface condition :
- 07. Surface roughness :
- 08. Particle Concentration :
- 09. Temperature :
- 10. Lighting :
  
- 11. Magnetisation :
- 12. Sensitivity check :
- 13. Calibration :
- 14. Testing :
- 15. Evaluation :
- 16. Acceptance :
- 17. Post cleaning :
- 18. Personnel :

Sketch of testing pattern

Date	Prepared By	Reviewed & Approved by

**Mr.E.Sathya Srinivasan, Chief Executive, QTECH Inspection Services, Chennai**



**ULTRASONIC EXAMINATION**  
**TECHNIQUE SHEET**

Surface Condition		Type of Wave	
Machine Make		Technique	
Equipment, Sl.No		Material Grade	
Calibration Block			

**Scanning Setup Details**

**Product Form**

Make		Beam Path (mm)	
Search Unit Angle		Above Zero Ref. (dB)	
Probe Frequency (MHz)		Base Metal Type	
Primary Reference dB		Base Metal Thickness	
Screen Range (mm)		Scan Face	
Surface Temperature		Welding Process	

Access Limitation (If any)

**SKETCH & SCAN PLAN**



# Questions ? Answers ?

## TENSILE TEST

### PROBLEM NO #1

A STEEL SPECIMEN is tested in a standard Tension Test to evaluate several mechanical properties .The dimension of the specimen and observations made during the test are given below

Dimension of the specimen	12.5 mm
Gauge Length	62.5 mm
Load at Yield Point	41kN
Maximum Load	72.5 kN
Fracture Load	51.25 kN
Gauge Length at Fracture	80.5 mm
Diameter of Fracture Section	9.5 mm
Strain at Load of 20 kN	$7,764 \times 10^{-4}$ mm/mm

Determine :

1. The yield Strength
2. The ultimate Tensile Strength
3. The % of Elongation
4. Modulus of Elasticity
5. % of reduction in area
6. Fracture Stress
7. Modulus of Toughness

$A_o$  = The original area of Cross Section of Test Specimen =  $\frac{\pi}{4} \times D_o \times D_o = 122.72 \text{mm}^2$

$A_f$  = Final area = Area After Fracture =  $\frac{\pi}{4} \times D_f \times D_f = 70.88 \text{mm}^2$

a	Yield strength	Yield Load/ $A_o$	$41 \times 10^3 / 122.72$	334.1 N/mm <sup>2</sup>
b	Tensile Strength	Ultimate Load/ $A_o$	$72.5 \times 10^3 / 122.72$	590.77 N/mm <sup>2</sup>
c	% of Elongation	Final Length-Original Lengthx100/Original Length	$(80.5 - 62.5) \times 100 / 62.5$	28.8%
d	Final Modulus of Elasticity	Stress at 20kN/Strain at 20kN	$\frac{20 \times 10^3 / 122.72}{7,764 \times 10^{-4}}$	2.1x10 <sup>5</sup> N/mm <sup>2</sup>
e	% of reduction in area	$A_o - A_f \times 100 / A_o$	$(122.78 - 70.88) \times 100 / 122.72$	42.24%
f	Breaking Stress	Breaking Load/ $A_f$	$51.25 \times 10^3 / 70.88$	723 N/mm <sup>2</sup>
g	Modulus of Toughness	Ultimate Tensile Strengthx%of Elongation	$590.77 \times 0.288$	170.44 N/mm <sup>2</sup>

#### Question:

Is there any standard specified in construction code to perform RT tests and also to evaluate Radiographic Films of SS Butt joints?

#### Answer:

Code neither specifies nor prohibits examination of a long seam weld by RT. Manufacturer shall use his own procedure and acceptance norm, for examining such weld seam and shall be able to demonstrate to the satisfaction of the inspector.

### PROBLEM NO #2

The following data were obtained in a Tensile Test on a specimen of 15mm diameter with a 50mm Gauge Length

Load (kN)	70	120	150	160	170	200	220	233	235	220
Extension	0.25	0.40	0.50	0.60	0.75	1.75	3.00	5.00	6.50	8.00

The Specimen Diameter after fracture was 12.45mm  
 Determine Tensile Strength, Young's Modulus, 0.2% Proof Stress, % Elongation, Reduction in cross sectional area.

$$A_0 = \text{Cross Sectional Area of Test specimen} = A_0 = \frac{\pi}{4} D_0^2 = 176.7 \text{ mm}^2$$

$$A_f = \frac{\pi}{4} D_f^2 = 121.7 \text{ mm}^2$$

a	Yield strength	Yield Load/ $A_0$	$235 \times 10^3 / 176.7$	1330 N/mm <sup>2</sup>
b	Young's Modulus	Stress/Strain	$300 \times 10^3 / 176.7$	84.8 x 10 <sup>3</sup> N/mm <sup>2</sup>
c	0.2% Proof Stress	$0.2 \times 50 = 0.1$ mm 100	$164 \times 10^3 / 176.7$	928 N/mm <sup>2</sup>
d	% of Elongation	Increased Length Where Fracture Obtained From Graph	$7.3 \times 100 / 50$	14.6%
e	% of reduction in area	$(A_0 - A_f) \times 100 / A_0$	$(176.7 - 121.7) \times 100 / 176.7$	31.1 %

$$\text{Young's Modulus} = \frac{\text{Load/Area}}{\text{Change in length/Original Length}} = \frac{\text{Slope} \times \text{Original Length}}{\text{Area of Cross section}}$$

### Question:

What kind of discontinuities are expected to be identified in RT evaluation?

### Answer:

Pin holes, Porosities, Cracks, lack of fusion, incomplete penetration. However, these defects are usually open to surface for thin sheets used for bellow elements and Liquid Penetrant Tests either direct or reverse capillary action PT are adequate.

## PROBLEM NO #3

Manufacture of Stainless Steel(SS) bellow expansion joints.

The bellow expansion joints are used in pressure vessels, heat exchangers or piping to absorb any axial, lateral or angular movement during operation. Often bellows elements are constructed using thin SS sheet of thickness less than 5mm (0.6 to 2.0 mm are common for multiply bellows). The sheets are rolled into tubular forms by folding the ends and joining the long seam by fusion welding as butt joint. Commonly used welding process is GTAW without use of filler for thin sheets. After welding and requisite examination, bellows are formed using suitable former /roller or hydraulic pressure. The long seam of bellows expansion joints are normally examined by RT before forming of bellows as per customer requirement or manufacturer's own quality standard.

### Question:

What examination does ASME code Sec VIII Div 1 require of such weld seams?

### Answer:

Appendix 26-11 in ASME Section VIII Div 1 has following requirements:

- Expansion joint flexible elements shall be visually examined and found free of unacceptable surface conditions, such as notches, crevices, material build-up or upsetting and weld spatter, which may serve as points of local stress concentration. Suspect surface areas shall be further examined by the liquid penetrant method.
- Bellows butt-type welds shall be examined 100% on both sides by the liquid penetrant method before forming. This examination shall be repeated after forming to the maximum extent possible considering the physical and visual access to the weld surfaces after forming.
- The circumferential attachment welds between the bellows and the weld ends shall be examined 100% by the liquid penetrant method.
- Liquid penetrant examinations shall be in accordance with Mandatory Appendix 8, except that linear indications shall be considered relevant if the dimension exceeds 0.25 $t_m$ , but not less than 0.010 in. (0.25 mm), where  $t_m$  is the minimum bellows wall thickness before forming.

In general RT is not required to check the quality of SS Thin sheet welding.

Mr. Vivek has donated a MPI bench machine model (Head & Coil Shot ) machine 1000 ampers AC & HWDC to our chapter in memory of his father Mr.M.V.Rajamani (our Past Chairman).



**CO-SPONSOR**

**G.K.N. Associates**

G.K.N. Associates , established in the year 2007 is involved in design and drawings preparation through AUTO-CADD both in 2D/3D Versions for heat recovery systems from Agro Waste, coal, solar, producer gas, furnace oil and diesel as per National and International codes. We are consulting engineers for process industries including chemical, textile, oil and rice mills. Our main objective is utilization of State of the Art Technology to conserve Energy, Control Pollution and improve process efficiencies.

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**Do You Know?**

1. What is the distinction between EMF and Potential Difference ?
2. Why earth is considered as Zero potential
3. In what ways are electric and magnetic field different ?

Indian Society for



Non-Destructive Testing  
Chennai Chapter



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**Mr. R. Vivek**

**Mr. Rabin**